U. S. NAVAL AIR DEVELOPMENT CENTER

JOHNSVILLE, PENNSYLVANIA

ENGINEERING DEVELOPMENT LABORATORY

REPORT NO. NADC-ED-L6174B

~~27 DECEMBER 1961~~
~~2 MARCH 1962~~
3 JUNE 1963

B

DESCRIPTION OF
AERIAL TARGET CONTROL CENTRAL
AN/MSQ-51

BUREAU OF NAVAL WEAPONS
WEPTASK NO. RMWC 53301/202-1/F017-08-005

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REVISION	DATE	REVISED PAGES	APPROVED
A	3/2/62	1 and 3 Figures 7 and 8 added	
B	6/3/63	Title Page, Pages 1, 2, 3 and 4, Figures 1, 7 and 8	

The portion of the text affected by the current revision is indicated by a vertical line in the margin of the page.

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Subj: Weptask No. RMWC 53301/202-1/F017-08-005; Aerial Target Control Central; Description of

Ref : (a) BuWeps Contract NOw 61-0755f
(b) BuWeps Specification XAV-76A with Amendments 1 and 2

Figure: (1) Operations Trailer
(2) Power Trailer
(3) Maintenance Trailer
(4) Auxiliary Control Station
(5) Acquisition Antenna Trailer
(6) Acquisition Antenna Assembly
A | (7) Tactical Control Console
(8) Tracking Console

1. The Bureau of Naval Weapons (BuWeps) is procuring aerial target out-of-sight control centers under reference (a). These control centers are being configured in accordance with reference (b). This report has been prepared to acquaint the target operating activities and other interested parties with this system.

B | 2. The Aerial Target Control Central (ATCC) provides a facility for the remote control of various fixed wing pilotless aircraft. It is composed of four mobile trailers two of which have air conditioned and heated working spaces and features a self-contained prime power system. The system may be moved over highways or unimproved terrain for emplacement and operation where required.

B | 3. The functional parts of the ATCC are a surveillance radar, a tracking radar, a command control radio system, a radio communications
B | system, and an electrical power system. Certain units are equipped with a telemetry receiving system.

4. Radio remote control of targets is accomplished by the use of Target Control System AN/SRW-4D which permits control of QF-9F, QF-9G, Q-2C, KDA-1, KDA-4, KDB-1 and KD2R-5 fixed wing targets. Control
B | capability for QH-50C (DASH) rotary wing targets has been incorporated in two units. Control of targets can be accomplished either from a Primary Operator's Position in the Operations Van or from a portable Secondary Operator's Position located outside the van. Each position has provision for the use of various control boxes as required for the different target types. The radio frequency output is 1000 watts, UHF, FM providing either on-off (Beep) or proportional control. (Or digital control for rotary wing).

5. A modified Anti-Aircraft Fire Control System M33 "S" band acquisition radar provides continuous surveillance of the area

surrounding the radar and presents position information on all targets in this area. Aircraft recognition is provided through the use of
B | Mark X IFF equipment with SIF. RF energy is radiated at a peak power of one megawatt in the 3100 to 3500 mc. frequency band at a PRF of 1000
B | or 400 PPS and in the 1,010 to 1,030 mc. frequency range with a peak power of 1.5 kilowatts. Presentation is made on 10 inch PPI scopes at the Surveillance and Tracking Radar Operators Positions. Radar modifications include the addition of a low noise radio frequency parametric amplifier to the radar receiver, reduction of the antenna rotational speed to five, ten, and twenty r.p.m. and addition of a 400,000 yard range scale to the PPI's. The range limits of the surveillance radar are 100,000 yards against a target of two square meters area and 400,000 yards against IFF equipped targets.

6. A modified M33 "X" band tracking radar provides precision tracking of aerial targets. Any target appearing on the surveillance radar display may be transferred to the tracking radar which then tracks it in a manual or automatic mode. The radar is capable of tracking skin and beacon returns and can display both simultaneously. Radar information is displayed on range, elevation and azimuth indicators. This information is resolved into horizontal plane coordinates by a computer and displayed on a 30 x 30 inch plotting board. Target altitude and rate of change of altitude are also derived in the computer and displayed on meters. The radar transmits RF energy at a peak power of 250 kw in pulses of 0.25 microsecond duration in the frequency band of 8500 to 9600 megacycles. For single pulse operation PRF's of 400 and 1000 PPS are used. Double pulse operation is provided at 400 PPS.
B | Although the tuning range of the radar is 8500 to 9600 mc., operation in the beacon tracking mode will be in restricted frequency bands as follows: Transmit 9215 to 9285 mc., Receive 9340 to 9370 mc. The antenna is a vertically polarized lens type with conical scan. Modifications to the basic M33 tracking radar include double pulse beacon coding, addition of a separate beacon local oscillator, addition of a variable power divider and dummy load, modification of the tracking operators console to permit one man operation instead of three and other minor modifications. Range capability is increased to 60,000 yards against a two square meter target and 400,000 against a beacon.

7. HF communication (2 to 25 mc.) is provided by one Single Sideband Transceiver (SST), Collins Radio Co. Model 618T-3 in conjunction with
B | Control Unit 714E-2 and Antenna Coupler 180L3. This provides 28,000 selectable channels in the SSB mode with 400 watts PEP or in the AM mode with 100 watts of carrier power. UHF communication (225 to 400 mc.) is provided by two Radio Sets AN/GRC-27 in conjunction with Control-Indicator 6-806/GR. This provides 1750 channels, ten of which may be preset. An intercommunication system is provided to enable communications between the various operating positions.

8. The Telemetry Receiving Station is an FM/FM type system capable
B | of displaying complete QF-9G or Q-2C information furnished by the respective telemetry transmitting systems. The telemetry receiving system consists of:

a. FM radio receiver, operating in the 225 to 265 megacycle range.

b. Ten FM Subcarrier Discriminators operating in the Inter-Range Instrumentation Group (IRIG), channels 5 to 14 inclusive.

c. Ten ruggedized ammeters with the meter faces calibrated in accordance with the target functions being monitored.

B d. Telemetry directional helical receiving antenna. This antenna is mounted on top of a mast ten feet high and located approximately 100 feet from the operating van.

9. Physically the ATCC consists of the following units (See figures 1 through 6.)

Operations Trailer Assembly
Power Trailer Assembly
Maintenance Trailer Assembly
Auxiliary Control Station
Antenna Trailer Assembly
Acquisition Antenna Assembly
Interconnecting Cable Kit
DASH Control Station (Supplied with two units only)

a. The Operations Trailer Assembly is a new "fifth-wheel" type trailer van, climatized by a combination 15 ton air conditioner and electric heating system. This van contains the following units:

(1) AN/SRW-4D System
(2) Computer Assembly (Modified M33 Unit)
(3) Tactical Control Assembly (Modified M33 Unit)
(4) Tracking Console Assembly (Modified M33 Unit)
(5) Tracking Antenna Assembly (Modified M33 Unit)
(6) Radar Unit Assembly (Modified M33 Unit)
(7) Modulator Cabinet Assembly
(8) Two (2) Radio Sets, AN/GRC-27
B (9) HF Radio and Stowage Assembly (SST 618T-3)
(10) Radio Control Console
(11) 28 v.d.c. Power Supply
(12) Antenna Assemblies for Target Control and Communications (7 Units)
B (13) Telemetry Receiving Station (as required)

Three operating positions are provided in the Operations Trailer; a primary (Target Control) position, a surveillance (Acquisition Radar) position, and a tracking (Tracking Radar) position. Monitoring of the AN/SRW-4D commands is provided by a light display system and recorded A permanently by an "on-off" type recorder. These operating positions are shown in figures 7 and 8.

b. The Power Trailer Assembly contains two 100 kw. diesel driven generators to supply the 60 cycle per second load, a 60 c.p.s. to 400

c.p.s. motor-generator to supply the 400 c.p.s. radar load and a switching and distribution panel. The air conditioning and utility load is supplied by one 60 c.p.s. generator and the operating load (radar, target control, communications) is supplied by the other 60 c.p.s. generator, with provision to interchange loads if required.

c. The Maintenance Trailer Assembly is an M-244 trailer modified mainly by the addition of a 3 1/2 ton air conditioner and heating system and removal of the present fuel burning heater. An intercom station is also provided.

d. The Auxiliary Control Station is a portable unit for target control by a secondary operator. It contains control units for the AN/SRW-4D system, indicating meters and an intercom station.

e. The Antenna Trailer Assembly is an M-243 trailer, modified to provide stowage of various small assemblies. The acquisition antenna is transported on this trailer.

f. The Acquisition Antenna Assembly consists of the acquisition RF coupler, the acquisition modulator and trigger and the acquisition antenna drive. This is a modified receiver-transmitter, acquisition group of the M33 system.

g. The Interconnecting Cable Kit consists of 21 reels containing all the external interconnecting cables required for the system.

B | 10. An estimate of personnel requirements for the ATCC is given below.

a. Operating Personnel

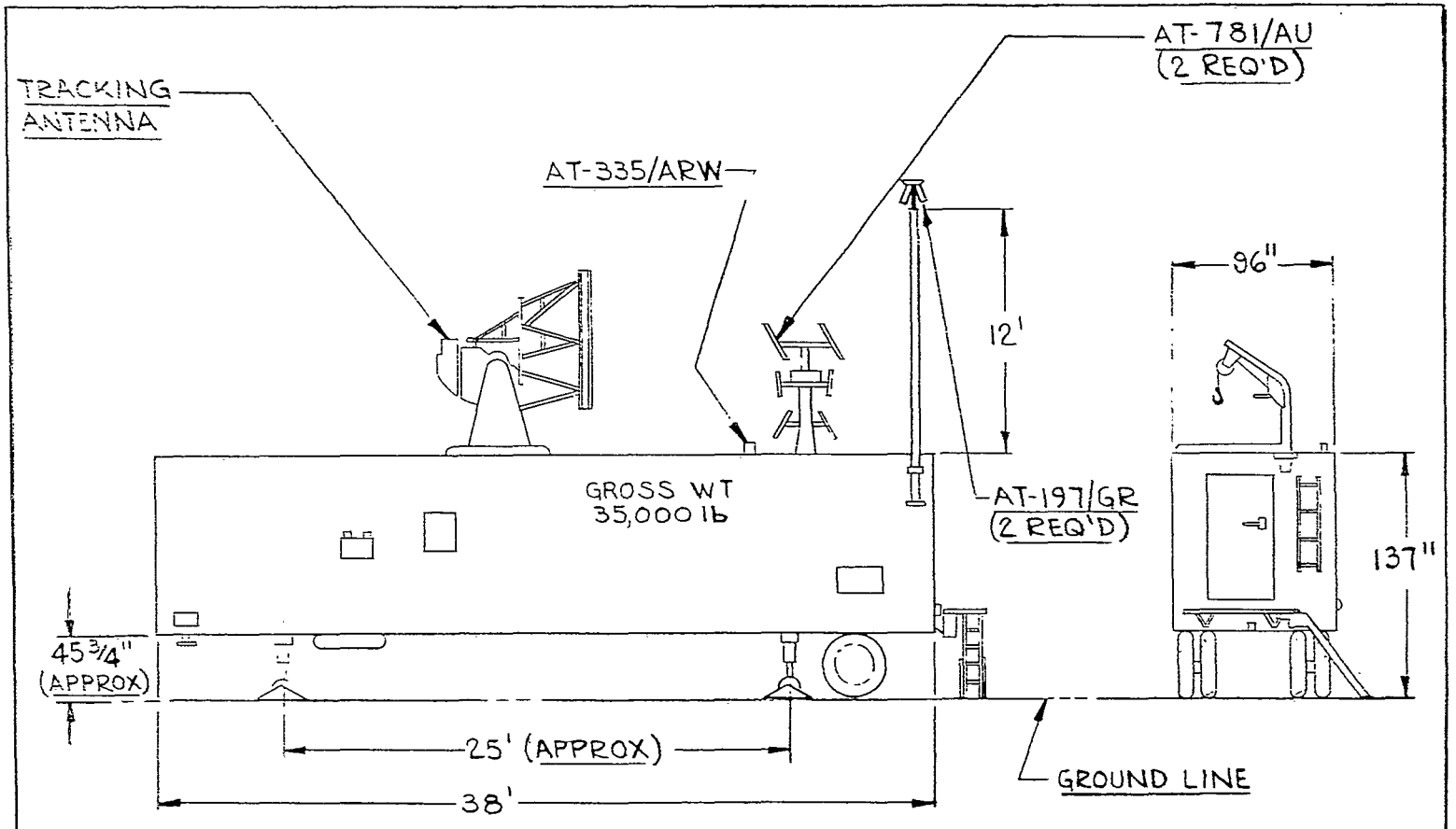
Tracking Radar	- One Radarman
Surveillance Radar	- One Radarman
Primary Control	- One Drone Controller
Secondary Control	- One Drone Controller

b. Maintenance Personnel

Radar	- Six Radar Technicians
Command Control Equipment	- Two Electronics Technicians
Communications Equipment	- Two Electronics Technicians
Power Units, Air Conditioners and Accessories	- Two Mechanics, Two Electrical Technicians

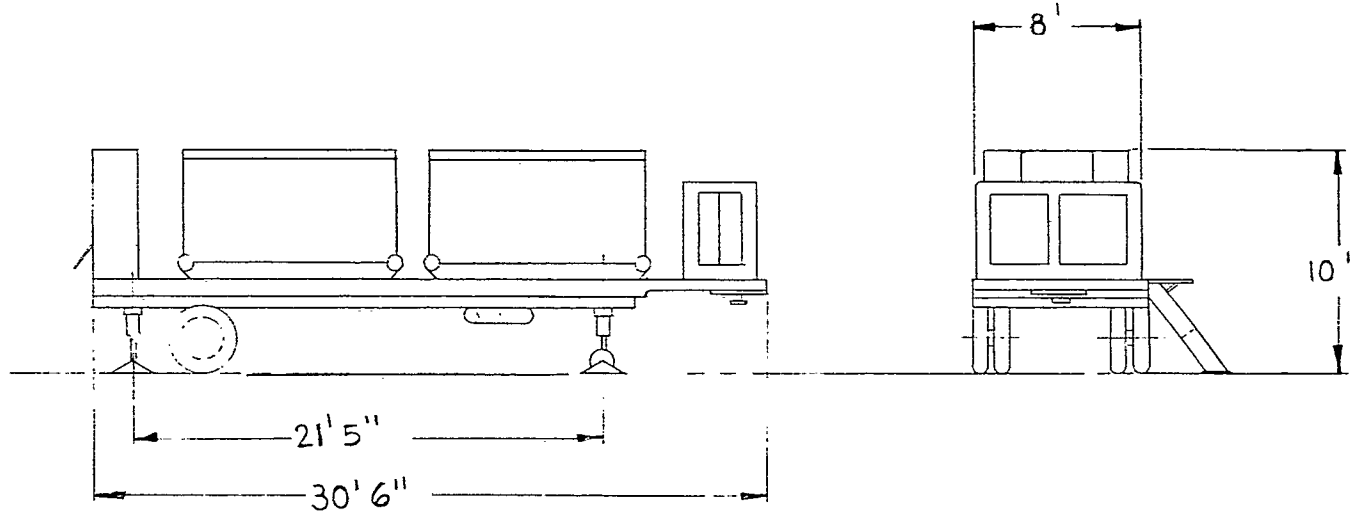
Prepared by: ____________________

Approved by: ____________________
Supt., Target Systems Division



OPERATIONS TRAILER

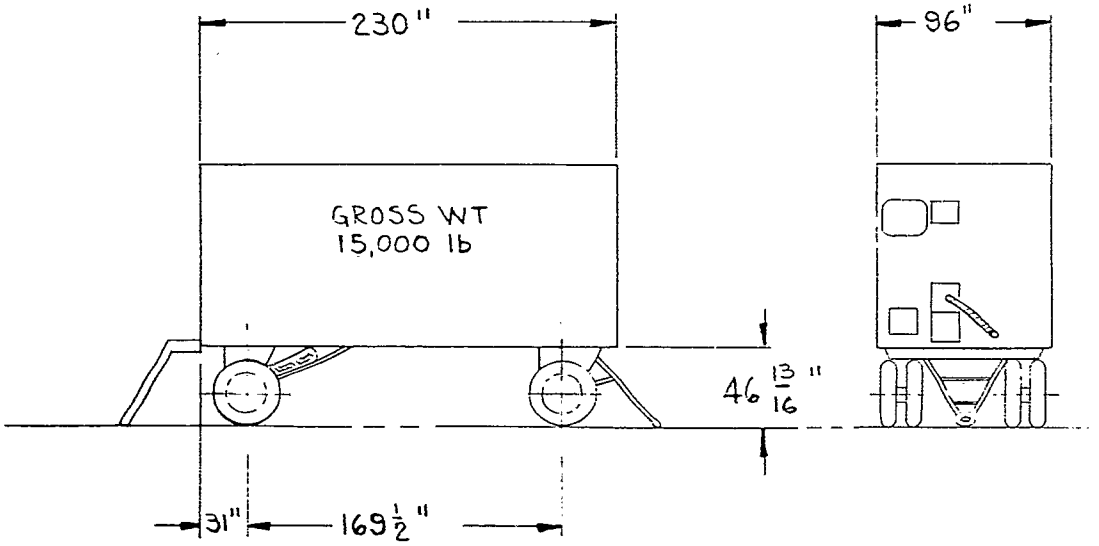
FIG. (1)



GROSS WT
24,000 lb (APPROX.)

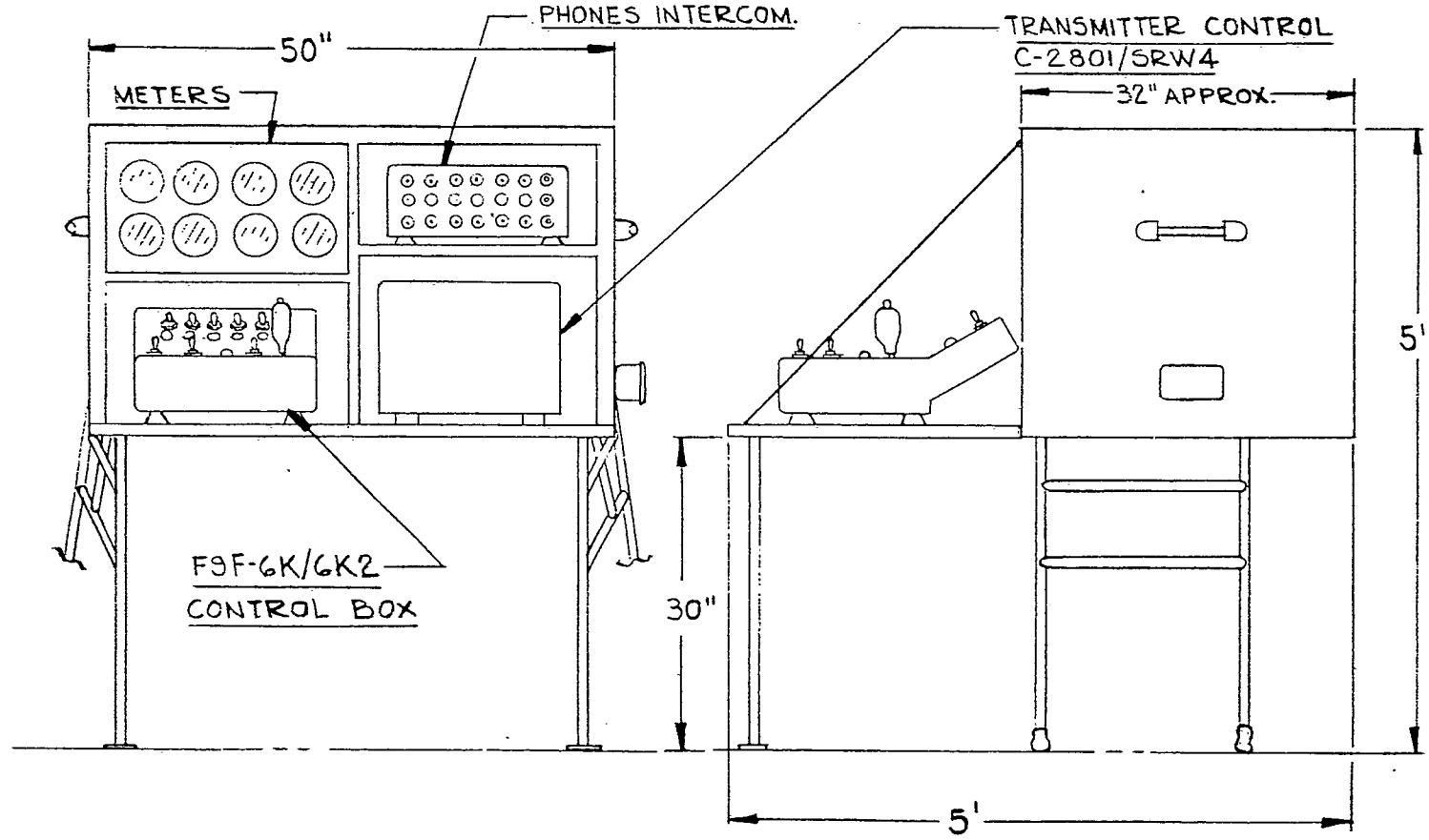
POWER TRAILER

FIG. (2)



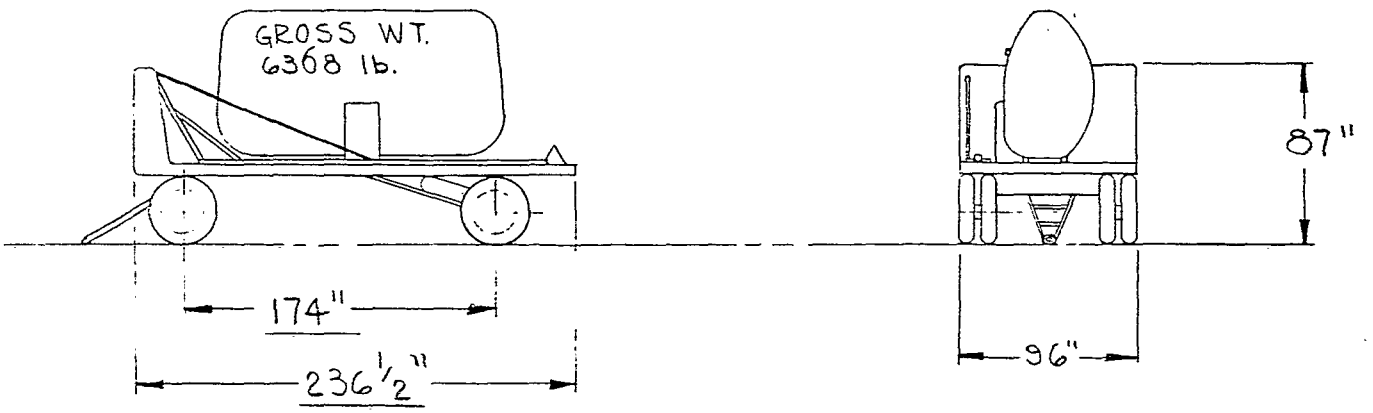
MAINTENANCE - TRAILER

FIG. (3)



AUXILIARY CONTROL STATION

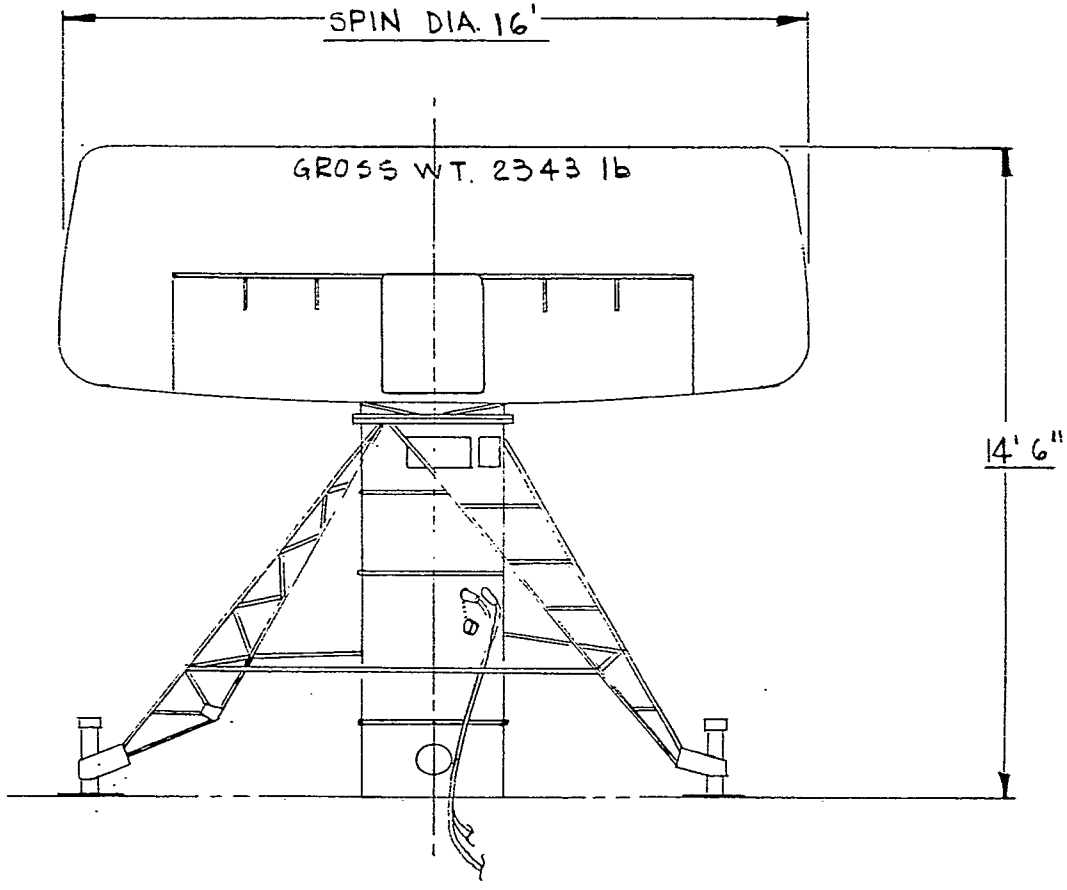
FIG. (4)



GROSS WT. TRAILER = 5,548 lb
ANTENNA = 820 lb

ACQUISITION ANTENNA TRAILER - M243

FIG (5)



ACQUISITION ANTENNA ASSY

FIG (6)

TACTICAL CONTROL CONSOLE AND COMPUTER

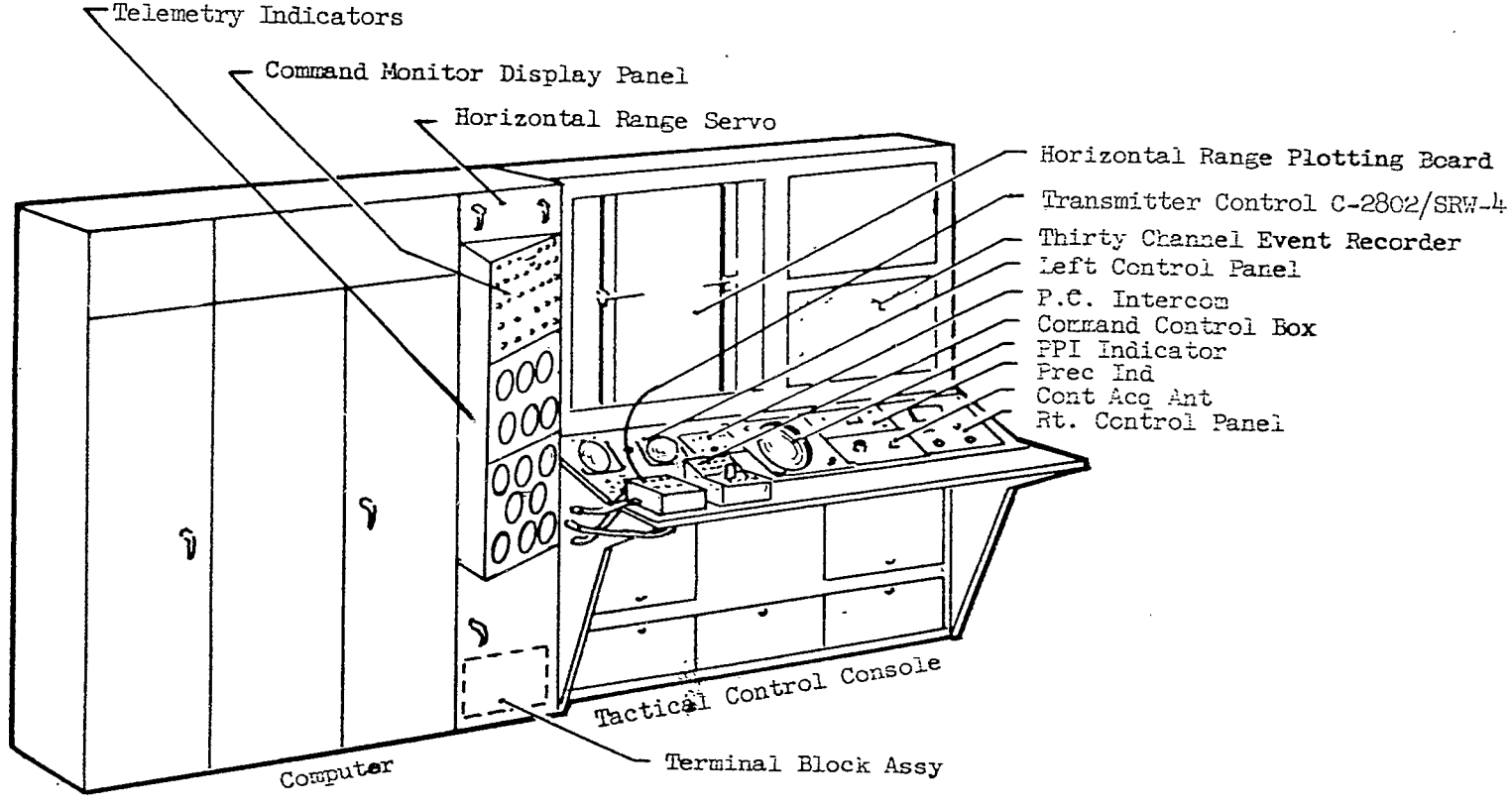


Figure 7.

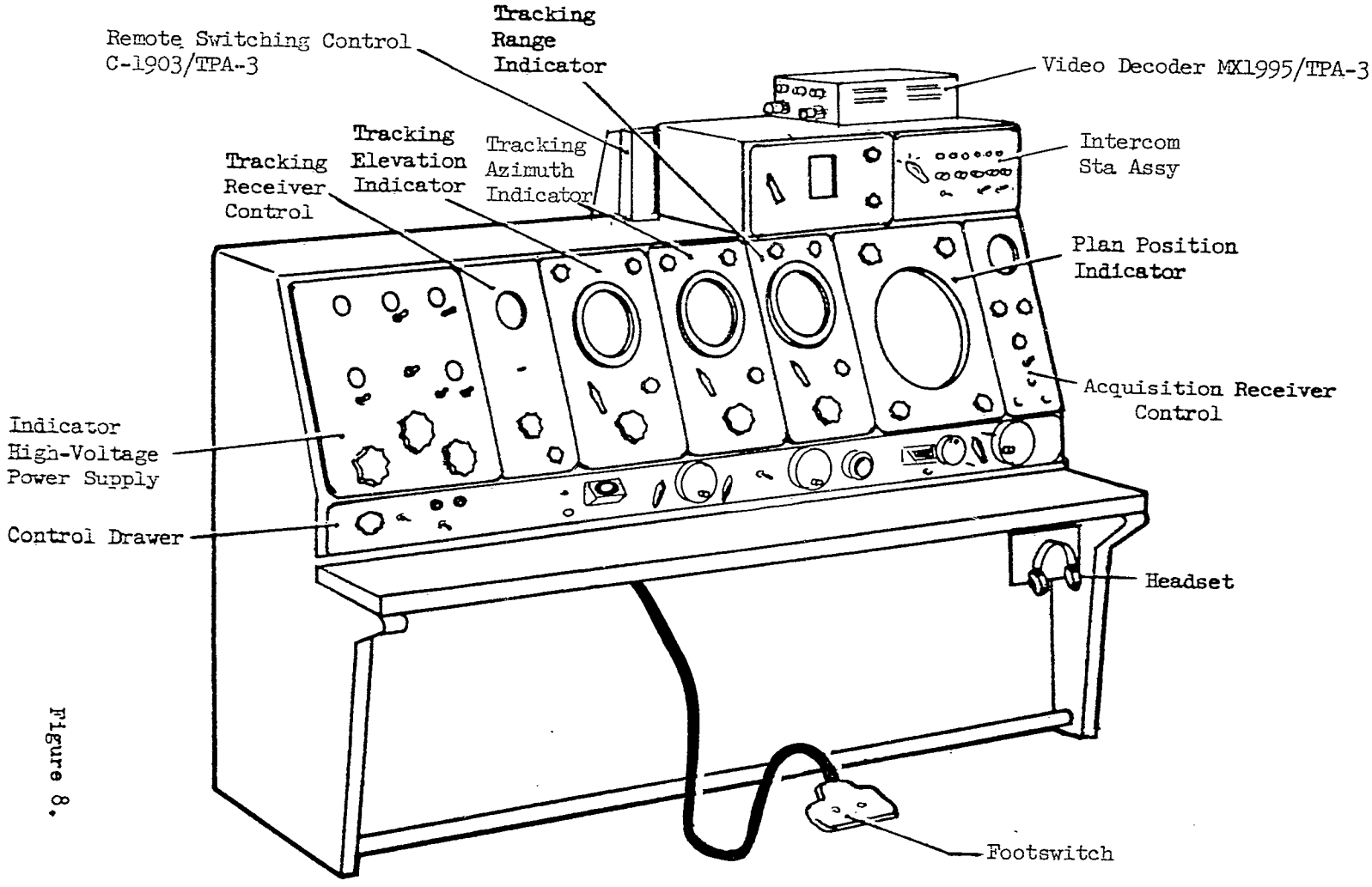


Figure 8.

TRACKING CONSOLE

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